

## INSTALLATION/REMOVAL TOOL FOR NIGHT VISION CAMERA

### Background of the Invention

[0001] This application relates to a night vision system, and more particularly to a tool for an aiming assembly associated with a night vision camera.

[0002] A recent development in heavy vehicles such as tractor trailers, trucks, and the like is the use of a night vision system to assist in viewing the road during nighttime hours or inclement weather. A camera is mounted or installed in a vehicle or truck cab (where there is an unobstructed view of the road), preferably at a location that does not detract from the aesthetics of the vehicle and is protected from the elements. Moreover, it is desirable to have the camera located in an area where it is accessible for servicing, adjustment, etc.

[0003] By way of example only, it has been proposed to mount a night vision camera where the lens or opening faces forwardly from the cab. One suggested location is in an overhead storage compartment above the windshield that provides an unobstructed view of the road. The view of the road is similar to that of the driver from behind the steering wheel. It will be appreciated, however, that truck cabs of different makes and models will result in different mounting locations or orientations of the camera in the truck cab. Accordingly, an aiming assembly is provided that extends between the mounting surface and the camera and allows for selective angular adjustment of the camera to position the camera at the desired angle.

[0004] A conventional aiming assembly is a compact right angle adjustment arrangement that has a first shaft having a first end that operatively engages the night vision camera. The second end is received in the housing and cooperates with a second shaft through a right angle drive arrangement. A second end of the second shaft includes a uniquely configured nut that has first and second tabs or lugs diametrically opposed from one another. The nut is mounted for pivoting movement on the second shaft and must be rotated through ninety degrees (90°) between locked and unlocked

positions. The nut is difficult to rotate manually. Moreover, the nut is typically formed of a plastic material and is easily damaged if a grasping tool, such as a pair of pliers, is used. The unique shape of the nut results in difficulty in rotating the nut of the aiming assembly during installation and removal of the night vision camera. Likewise, since the plastic nut can be easily damaged, it becomes more difficult to operate if repeatedly installed, removed, or adjusted.

**[0005]** Accordingly, a need exists for an improved tool that provides for easy locking and unlocking. It is also desirable that the tool be ergonomically designed to rotate the nut without damage during operation, easy to manufacture and also have a conformation that can be easily grasped and operated by a user.

### **Summary of the Invention**

**[0006]** A new and improved installation/removal tool for a night vision camera is provided.

**[0007]** The tool includes a handle dimensioned for receipt in a user's hand and has a tool at one end configured for mating engagement with a nut on a shaft of an aiming assembly.

**[0008]** The handle is preferably elongated to allow a user to easily grasp and operate, i.e., apply the desired torque to the nut on the shaft.

**[0009]** At one end of the elongated handle is a tool head having first and second clearances or grooves formed diametrically opposite one another. The grooves are dimensioned to closely receive the drive lugs associated with the nut on the shaft of the aiming assembly. A central recess in the tool head is dimensioned for sliding receipt over a substantially cylindrical portion of the nut and provides a total capture or encapsulation about the nut as torque is applied through the handle.

**[0010]** The tool provides for ease of installation and removal of the night vision camera.

**[0011]** The tool is easily manufactured and has an ergonomic design that allows for selective rotation of the nut without damage.

[0012] Still other features and benefits of the present invention will become apparent to those skilled in the art upon reading and understanding the following detailed description.

### **Brief Description of the Drawings**

[0013] FIGURE 1 is an isometric view of a preferred form of aiming assembly used in association with a night vision camera.

[0014] FIGURE 2 is an elevation view thereof.

[0015] FIGURE 3 is an overhead plan view of the aiming assembly of FIGURE 2.

[0016] FIGURE 4 is an elevational view taken from the right-hand end of FIGURE 2.

[0017] FIGURE 5 is an elevational view of a preferred embodiment of the adjuster tool.

[0018] FIGURE 6 is an end view taken generally from the left-hand side of FIGURE 5.

### **Detailed Description of the Preferred Embodiment**

[0019] FIGURE 1 illustrates an aiming assembly **10** as conventionally used with a night vision camera (not shown) of a night vision system. Typically, the camera is mounted to multiple adjustment or aiming assemblies of this type to allow selective pivoting of the camera about two perpendicular axes. Thus, the aiming axis or focal direction of the camera can be selectively oriented about the two axes by selectively advancing and retracting, i.e., altering, the adjustment assemblies. Particularly, the adjustment assembly **10** includes a housing **12**, shown here as a parallelepiped structure. The housing has first and second flanges **14, 16** with openings **18, 20** that receive a fastener (not shown) for securing the adjustment assembly to a mounting surface (not shown). Extending outwardly from one face of the housing is a first shaft **30**. A first end **32** of the first shaft extends into the housing. Although not visible in FIGURE 1, the first

end **32** includes a gear or thread that cooperates with a mating gear or thread to advance and retract the camera.

**[0020]** A second or outer distal end **34** of the first shaft has a unique configuration in which circumferentially spaced lobes **36** define drive surfaces or drive members, and similarly encloses a recess **36'** that has similarly shaped recesses defining drive surfaces. Here, six drive surfaces are provided on the second end, although it will be appreciated that a greater or lesser number, or different style of drive surface, can be used without departing from the scope and intent of the invention. As will be described in greater detail below, the distal end is selectively rotated to adjust the position of the camera

**[0021]** A second shaft **40** extends outwardly from the housing along a face of the housing that is perpendicular to the face from which the first shaft extends. The second shaft includes a first or inner end **42** received in the housing for operative engagement with the first end of the first shaft. Again, a gear or threaded end provides for a preselected ratio, right angle gear drive. Thus, rotation of the input shaft **40** results in selective advancement and retraction of the second shaft **30** relative to the housing. A second or outer end **44** of the input shaft includes a uniquely configured nut **46**. The nut has a smooth-walled, substantially cylindrical portion **48** from which extend first and second tabs or lugs **50, 52**. Spaced axially inward is a shoulder **60** having radially outward extending mounting flanges **62, 64** that are dimensioned for locking engagement with the camera and also define a stop surface, as will become more apparent below.

**[0022]** The aiming assembly is secured to a mounting surface via fasteners through the retaining lugs **14, 16**. A night vision camera is then operatively secured to the mounting flanges located adjacent the second end of the second shaft **30**. Selective rotation of the nut **44** provided on the input shaft **40** provides for locking engagement with the camera, typically by rotating the nut relative to the second shaft through approximately ninety degrees (90°). The nut is pivotally mounted on the second shaft, however, it is difficult to rotate the nut relative to the shaft.

**[0023]** A preferred tool that cooperates with the nut on the aiming assembly is more particularly illustrated in FIGURES 5 and 6. The tool **70** has an elongated handle portion **72**, shown here as a hollow cylindrical member, having an inner diameter **74** and an outer diameter or external surface **76**. Although not necessary, for ease of manufacturing, the opening **74** extends through the entire length of the elongated handle. Likewise, the external surface **76** is shown as a smooth-walled surface for ease of manufacture, although it will be understood that the handle may include a ribbed or knurled surface or similar anti-slip surface that allows the user's hand to firmly grip and engage the tool handle.

**[0024]** At one end **78** of the handle is provided a tool head **80**. The tool head is dimensioned for close fitting engagement with the nut. More particularly, the opening **74** is slightly larger than the cylindrical portion **48** of the nut. This allows the tool to be axially advanced over the nut until the tool head engages the mounting flanges **62,64** that act as a stop surface. In addition, drive recesses **82, 84** extend radially outward from the central opening **74** in the tool. The drive recesses are dimensioned for mating receipt over the drive lugs **50, 52** on the nut. As will also be appreciated, the axial depth, i.e., the dimension **d** as shown in FIGURE 5 closely corresponds to the axial depth of the drive lugs on the nut. Thus, end face **86** engages the mounting flanges **62, 64** when the drive recesses **82, 84** are properly oriented over the drive lugs of the nut. In this manner, rotation of the handle transfers a torque to the tool head and nut to provide for selective locking and unlocking of the nut on the associated camera.

**[0025]** The invention has been described with reference to the preferred embodiment. Obviously, modifications and alterations will occur to others upon reading and understanding the preceding detailed description. It is intended that the invention be construed as including all such modifications and alterations in so far as they come within the scope of the appended claims or the equivalents thereof.